

USDA  
NATURAL RESOURCES  
CONSERVATION SERVICE  
  
MARYLAND CONSERVATION  
PRACTICE STANDARD  
  
**IRRIGATION SYSTEM,  
TAILWATER RECOVERY**  
  
CODE 447  
(Reported by No.)

**DEFINITION**

A planned irrigation system in which all facilities utilized for the collection, storage, and transportation of irrigation tailwater for reuse have been installed.

**PURPOSES**

This practice may be applied for one or more of the following purposes:

1. To conserve irrigation water supplies;
2. To improve offsite water quality.

**CONDITIONS WHERE PRACTICE  
APPLIES**

Tailwater recovery systems are applicable for use on lands and facilities that are served by a properly designed and installed irrigation systems, where recoverable irrigation runoff flows can be anticipated under current or expected management practices.

This standard applies to the planning and functional design of irrigation tailwater recovery systems including, but not limited to, pick-up ditches, sumps, pits, and pipelines. It does not apply to detailed design criteria or construction specifications for individual structures or components of the recovery system, for which other conservation practice standards are applicable.

**CONSIDERATIONS**

Consider designing irrigation systems that will

limit tailwater volumes to those needed for effective operation. This will minimize the size and extent of collection, storage, and transportation facilities.

Consider the changes in irrigation water management that may be needed to accommodate return flows.

Nutrient and pest management measures should be considered to limit chemical-laden tailwater as much as practical. Chemical-laden water can create a potential hazard to wildlife, especially to waterfowl that are drawn to ponded water.

Consider that downstream flows or existing wetlands that are dependent on irrigation runoff may be reduced by implementing tailwater recovery systems.

Consider methods to protect system components from storm runoff and excessive sedimentation.

**CRITERIA**

**General Criteria Applicable To All Purposes**

The installation and operation of a tailwater recovery system shall comply with all federal, state and local laws, rules and regulations. Laws and regulations of particular concern include those involving water rights, land use, pollution control, property easements, wetlands, and endangered species.

Tailwater recovery systems consist of collection facilities, storage facilities, and conveyance facilities. These facilities shall be designed and constructed according to appropriate NRCS standards and specifications. The criteria for the design of components not addressed in an NRCS practice standard shall be consistent with sound engineering principles.

All tailwater recovery systems shall be managed in accordance with the irrigation water management (IWM) plan. IWM plans shall be prepared in accordance with the NRCS conservation practice standard for Irrigation Water Management, Code 449.

**Collection Facilities** - Facilities for the collection of irrigation tailwater must be designed as inte-

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

gral components of irrigation systems, such as sprinkler systems. (Refer to NRCS conservation practice standard for Irrigation System, Sprinkler, Code 442.) Components of tailwater collection facilities include, but are not limited to, ditches, culverts, pipelines, water control structures, grade stabilization structures, or other erosion control measures, as needed.

**Storage Facilities** - Facilities are needed to store the collected water until it is redistributed in the irrigation system. Runoff volume and rate, as well as the required level of water control at the point where the tailwater is returned to the irrigation system, shall be assessed when determining the size of the storage facility.

For systems where tailwater is discharged into an irrigation pit or regulating reservoir, or into a pipeline with a mechanism for regulating fluctuating flows (e.g., a float valve), small sumps with frequently cycling pumping plants may be used. For systems unable to regulate flows, tailwater sumps or pits shall be provided with adequate storage to permit efficient use of the water.

Tailwater storage requirements shall, as a minimum, include a volume adequate to store the complete runoff from a single irrigation set when:

1. Energy sources for tailwater pump-back systems are subject to interruption;
2. Safe emergency bypass areas cannot be provided; or,
3. Tailwater discharges will violate local or state regulations,

Sumps and pits shall be equipped with inlets designed to protect the side slopes and the collection facilities from erosion. A dike, ditch, or water control structure shall be provided, if required by state law, to limit the entrance of rainfall runoff into the designed inlet. Sediment traps shall be installed as needed.

**Conveyance Facilities** - All tailwater recovery systems require facilities to convey water from the storage facility to a point of entry back into the irrigation system. These facilities may consist of a pumping plant and pipeline to return the water to the upper end of the field, or a gravity outlet having a ditch or pipeline to convey the water to a lower elevation in the irrigation sys-

tem. Other components or combinations of components may be necessary as determined on a site-specific basis.

The capacity of conveyance facilities shall be determined by an analysis of the expected runoff rate, the planned irrigation pit or regulating reservoir storage capacity, and the anticipated irrigation application. If the return flow is used as an independent irrigation supply rather than as a supplement to the primary irrigation water supply, the rate and volume of flow must be adequate for the method(s) of water application employed.

### **Additional Criteria Applicable To Improving Water Quality**

**Storage Facilities** - Storage facilities shall be sized accordingly when additional storage is needed to provide adequate retention time for the breakdown of chemicals in the runoff waters. Allowable retention times shall be site specific to the particular chemical used.

Seepage from a storage facility shall be controlled to the extent practicable when the storage facility is expected to receive chemical-laden waters. Control may be in the form of natural soil liners, soil additives, commercial liners, or other approved methods.

Storage facilities shall also be sized accordingly when additional storage is required to provide for sediment deposition. Allowable retention times shall be site specific to the particular soil type(s).

### **SPECIFICATIONS**

Specifications for establishment and operation of this tailwater recovery systems shall be prepared for each field or treatment unit according to the Considerations, Criteria, and Operation and Maintenance described in this standard. Specifications shall be recorded using approved specification sheets, job sheets, narrative statements in the conservation plan, or other acceptable documentation.

### **OPERATION AND MAINTENANCE**

An operation and maintenance (O&M) plan shall be prepared for use by the owner or others responsible for operating the system. The plan shall provide specific instructions for operating and maintaining the system to insure that it func-

tions properly. It should also provide for periodic inspections and prompt repair or replacement of damaged components.

The plan, as a minimum, shall include provisions to address the following:

1. Periodic cleaning and re-grading of collection facilities as needed to maintain proper flow lines and functionality;
2. Periodic checks and removal of debris as necessary from trash racks and structures to assure proper operation;
3. Periodic removal of sediment from traps and/or storage facilities to maintain design capacity and efficiency;
4. Inspection or testing of all pipeline and pumping plant components and appurtenances, as applicable;
5. Routine maintenance of all mechanical components in accordance with the manufacturer's recommendations.

#### **SUPPORTING DATA AND DOCUMENTATION**

The following is a list of the minimum data and documentation to be recorded in the case file:

##### **Planning Information, Field Data, and Survey Notes**

1. Location and extent of the tailwater recovery system. Also note the location of the practice on the conservation plan map;
2. Describe the objective of the practice, including the desired functions that the system is expected to provide;
3. Soils investigation logs and notes, as appropriate for site conditions and the proposed design;
4. Topographic survey of the site, as appropriate for site conditions and the proposed design.

##### **Design Data**

1. Location map with the site identified;
2. Soil survey map with the site identified;
3. Calculations to determine the capacity and design of collection, storage, and conveyance components. System components must meet the criteria, specifications, and documentation requirements of Maryland NRCS practice standards, as applicable;
4. A plan view showing the components and layout of the tailwater recovery system;
5. Pump, water, and filter requirements;
6. Grading plan for the site, when appropriate.

##### **Construction Check Data/As Built Plans**

1. Documentation of site visits on CPA-6 assistance notes. Include dates of site visits, name or initials of the person who made the visit, specifics as to what was inspected, all alternatives discussed, decisions made, and by whom;
2. Check notes recorded during and after completion of construction showing the as built layout of the tailwater recovery system;
3. Indicate the construction's conformance to the design on the plan;
4. Sign and date check notes and plans by a person with appropriate approval authority. Include statement that the practice meets or exceeds plans and NRCS practice standards.

##### **REFERENCES**

1. University of Delaware, Cooperative Extension Service. *Delaware Irrigation Handbook*.
2. USDA, Natural Resources Conservation Service. *National Engineering Handbook, Part 652, Irrigation Guide*.